1,168,213

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,168,213

Date of Application (No. 15573/68) and filing Complete Specification: 1 April, 1968.

Complete Specification Published: 22 Oct., 1969.

Index at acceptance:—F2 U(13B, 17, 20A, 24B, 224, 230, 244, 348); B8 A(4K2C, 4P2D, 4P2Y); F2 Q7H

International Classification:—F 16 c 3/02

COMPLETE SPECIFICATION

Improvements in and relating to Torque Transmitting Elements

I, CLAUDE EDWARD KAWCHITCH, a citizen of the Commonwealth of Australia, of 1 Charles Street, Jolimont, in the state of Victoria, Commonwealth of Australia, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to torque transmitting elements and is concerned particularly with torque transmission shafts.

The production of many types of mechanical equipment involves the manufacture of large numbers of identical gear and shaft assemblies and great cost savings could be achieved if the gears and shafts of these assemblies could be moulded from plastics materials. For example, in a common type of roller conveyor drive system, each roller of the conveyor is provided with a shaft fitted with a worm gear and the worm gears engage a series of worms mounted on a common drive shaft. If the roller shafts and worm gears could be largely moulded from plastics materials great savings could be achieved. Furthermore plastics shafts could deform to cushion torsional shock loading on starting or sudden loading of the conveyor. However, it has hitherto not been possible to use plastics shafts in situations where they would be subject to bending loads because of poor resistance of plastics materials to bending stresses. The present invention has resulted from an attempt to solve this problem.

The invention provides a shaft for the transmission of torque from a drive means to a driven means, said shaft comprising a core of non-metallic material sheathed by a tubular sleeve of metal, the core and the sleeve being torsionally coupled together only within a region at one end of the shaft, said core including a portion, spaced from the region where the core is coupled to the sleeve, which includes means for torsionally coupling the core to the drive means.

In order that the invention may be more fully explained, part of a roller conveyor drive mechanism which embodies the invention will now be described in detail with reference to the accompanying drawings in which :—

Figure 1 is an end elevation of part of a worm gear drive for a conveyor roller 11;

Figure 2 is a cross-section on the line 2—2 in Figure 1;

Figure 3 is a perspective view of a flanged shaft incorporated in the roller drive and constructed in accordance with the present invention; and

Figure 4 is a longitudinal section through one end of a slightly modified form of shaft constructed in accordance with the invention.

Conveyor roller 11 is one of a plurality of horizontal rollers arranged side by side along the conveyor and each provided with a shaft fitted with a worm gear, the worm gears engaging a series of worms on a common drive shaft 10. Roller 11 has an end cap 12 which comprises a central cup 13 to receive one end of a shaft denoted generally as 14.

Shaft 14 comprises a metal sleeve 15 and a hollow core 16 which extends through the sleeve and is moulded from a plastics material, for example a polycarbonate or an acetal resin. A bolt 17 extends through core 16 and its screw thread 20 engages an internal thread 18 formed in cup 13. Bolt 17 is tightened against a washer 30 located in an annular recess in core 16 at the other end of the shaft so that core 16 and sleeve 15 are drawn into cup 13.

At the end of the shaft which fits within cup 13, core 16 and sleeve 15 are torsionally coupled together by the engagement of a pair of bosses 21 on the core with a pair of diametrically opposite holes 19 in the sleeve. However, over the remainder of the length of the shaft there is no torsional coupling between the core and the sleeve, the core being a free

fit with the sleeve. Sleeve 15 is a forced interference fit in cup 13.

As will be apparent, it is not essential that there should be a pair of bosses 21 and a pair of diametrically opposite holes 25 in order to provide the torsional coupling between the core 16 and sleeve 15. In some cases a suitable torsional coupling could be provided by a single boss engaging in a single hole in the sleeve. In other cases than two bosses and corresponding holes could be provided.

Core 16 is provided at one end with an internal screw thread 22. This does not engage thread 20 of bolt 17, being of a larger size, and is provided merely to engage an extractor tool on dismantling of the roller drive.

The shaft is journalled for rotation in a journal bearing which is denoted generally as 23 and is bolted to a frame 25 of the conveyor. Bearing 23 comprises a body 24 having a part-spherical socket which houses an appropriately shaped sleeve 26.

A flange 27 is moulded integrally with the outer end of shaft core 16 to serve as a mounting for a worm gear denoted generally as 28. The inner face of flange 27 has a land 29 provided with an annular groove 35 which receives the end of sleeve 15. The outer face of the flange is provided with three relatively long pegs 31 and six relatively short pegs 32. Worm wheel 28 is moulded in two identical halves from a plastics material which may, for example, be a polycarbonate or an acetal resin. The two halves are placed together to form an outer rim 33, having worm wheel teeth 34 moulded into its outer periphery, and a central flange portion 36 having nine holes to receive pegs 31, 32 on flange 27. Pegs 32 extend right through gear flange 36 and are fitted with spring clips 37 to hold the worm wheel on the shaft.

Worm wheel 28 engages a worm 38 on the worm shaft 10. This shaft extends longitudinally of the conveyor and is provided with a separate worm adjacent each roller to engage a worm wheel coupled to the roller in the same manner as illustrated in the drawings. A packing washer 39 is located between flange 27 and bearing sleeve 26 and a further packing washer 40 is located between bearing sleeve 26 and roller cap 12 and the whole assembly held together on tightening of bolt 17.

In operation of the conveyor, worm 38 drives worm wheel 28 which is coupled to the outer end of shaft core 16 via flange 27. The inner end of shaft core 16 is coupled to roller 11 by virtue of the interference fit between cup 13 and sleeve 15 and the coupling between the sleeve and the core provided by the holes 19 and bosses 21. Thus the end of sleeve 15 within cup 13 serves as a shear coupling. However, it is to be noted that there is no torsion in the remainder of the sleeve, the torsion being transmitted from gear 28 along the core through the sleeve to the shear coupling. The sleeve provides most of the bending resistance of the shaft and prevents bending failure in core 16. The torsional resilience of core 16 absorbs any torsional shocks which may occur on stopping and starting or on sudden loading of the conveyor. If the shaft were constructed entirely of metal, such shocks would not be absorbed and could cause failure of gear teeth or other components of the drive mechanism.

Figure 4 illustrates an alternative method of connecting sleeve 15 to core 16 at one end of the shaft in which the sleeve is merely crimped or indented inwardly into the core at two diametrically opposed locations 41, 42. The number of locations at which the sleeve is crimped could, of course be increased to more than two or the sleeve could be crimped at one location only to provide the necessary coupling.

The illustrated construction, by providing a shaft and worm gear which utilizes moulded plastics components enables great savings to be achieved in the cost of a complete conveyor installation. However, this specific construction has been given by way of example only and may be varied. For example core 16 could be moulded from a hard natural rubber instead of a synthetic plastics material. It is accordingly to be understood that the invention is in no way limited to the specific construction described but may include many variations and modifications.

WHAT WE CLAIM IS:—

1. A shaft for the transmisstion of torque from a drive means to a driven means, said shaft comprising a core of non-metallic material sheathed by a tubular sleeve of metal, the core and the sleeve being torsionally coupled together only within a region at one end of the shaft, said core including a portion, spaced from the region where the core is coupled to the sleeve, which includes means for torsionally coupling the core to the drive means.

2. A shaft as claimed in claim 1, in which said drive means comprises a gear, said means on the core being adapted to mount the gear such that the gear will be torsionally coupled to the core.

3. A shaft as claimed in claim 2, in which said means comprises a flange on the core located at the end of the shaft remote from said region.

4. A shaft as claimed in claim 2 or claim 3, in which an end of the sleeve is located in a groove in the flange.

5. A shaft as claimed in any one of the preceding claims, in which the core is of a plastics material.

6. A shaft as claimed in claim 5, in which the core is moulded from a polycarbonate or an acetal resin.

7. A shaft as claimed in any one of the preceding claims, in which the torsional coupling between the core and the sleeve is provided by the engagement of at least one projection

on the core with an opening in the sleeve.

8. A shaft as claimed in any one of claims 1 to 6, in which the torsional coupling between the core and the sleeve is provided by indenting the sleeve against the core at one or more locations.

9. A drive for a conveyor roller, comprising a shaft as defined in any one of the preceding claims journalled at a location between the ends of the sleeve in a bearing, said one end of the shaft being coupled to the roller and the core being coupled at the other end of the shaft to a gear.

10. A shaft substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.

11. A shaft substantially as hereinbefore described with reference to Figures 1 to 3, as modified by Figure 4, of the accompanying drawing.

12. A conveyor roller drive substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawing.

13. A conveyor roller drive substantially as hereinbefore described with reference to Figures 1 to 3, as modified by Figure 4, of the accompanying drawing.

FORRESTER, KETLEY & CO.
Chartered Patent Agents,
Jessel Chambers,
88/90 Chancery Lane,
London, W.C.2.
and
Rutland House,
Edmund Street,
Birmingham 3.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969.
Published by the Patent Office, 25 Southampton Buildings, London, W.C.2, from which copies may be obtained.